INTERMOUNTAIN STATION
Central Reference File
No. 0.73

X2.237

APPLIED FORESTRY NOTES

NORTHERN ROCKY MOUNTAIN
FOREST AND RANGE EXPERIMENT STATION

No. 76 Missoula, Montana November 1936

TEST OF PRUNING EQUIPMENT AND METHODS IN WESTERN WHITE PINE

By

Kenneth P. Davis,
Assistant Silviculturist.

To supply information on pruning equipment and methods most effective in different western white pine stands suitable for pruning, a number of types of pruning equipment were tested recently on the Deception Creek Experimental Forest. Practically no pruning has been done to date in western white pine.

Tools Used

The tools used are shown in Plate 1. All except tool 1 are common types probably manufactured by several firms. The manufacturers of the particular tools used will be furnished on request. A detailed description of each tool together with wholesale cost follows:

1. Tree trimmer. Designed primarily for trimming limbs from competing trees. The tool is mounted on a pole and cuts both on draw and thrust stroke like a chisel. Not made commercially.

2. Pole-pruning saw. Eighteen-inch slightly concave blade, 3.2 inches wide at base, with 5 saw points per inch, cutting on the draw stroke. Two of these saws were used; one with an 8-foot and one with a 13-foot handle. Cost: saw with 8-foot pole, $2.35; with 14-foot pole, $2.72.

3. Pole-pruning saw. Fourteen-inch concave blade, 2 inches wide at base, with 8 long and slender saw points per inch, cutting on the draw stroke. Socket for pole attachment. Blade detachable from socket and is adjustable to 3 angles. Two of these saws were used; one with an 8-foot and one with a 13-foot handle. Cost without pole, $1.50.

4. Hand-pruning saw. Pistol grip handle; 14-inch concave blade, 2 inches wide at base and tapering to two-thirds inch at tip, with 8 short saw points per inch, cutting on draw stroke. Cost $0.87.

5. Hand-pruning saw. Pistol grip handle; 12-inch concave blade, 2 inches wide at base and tapering to two-thirds inch at tip, with 8 long and slender saw points per inch, cutting on the draw stroke. Cost $0.93.

6. Hand-pruning saw. Twenty-inch straight blade (17 inches with teeth), 5 inches wide at base, 1½ inches wide at tip, with coarse log saw teeth - 2 cutters and a raker tooth per inch. Carpenter saw handle. Cost $1.65.

7. Hand-pruning saw. Twenty-inch straight blade (17 inches with teeth), 5 inches wide at base, 1½ inches wide at tip, with 7 saw points per inch, cutting mostly on the thrust stroke. Ordinary carpenter saw type of handle. Cost $1.40.

8. Hand pruner. One flatly beveled cutting edge. Cuts up to about 1½ inches. One-piece hickory handles inserted in steel sockets.

9. Hand pruner. Built like a bolt cutter with 2 cutting edges sharpened to the tip. One edge flatly beveled, permitting cutting close to tree. Works best on limbs around 3/4 inches, but will readily cut up to 1¼ inches. Twenty inches long over-all. Cost $3.00.

Description of Work Done

Pruning tests were made in three stands chosen to represent the range of tree sizes that may be advantageously pruned. Most of the actual pruning was done by four CCC boys, all totally unfamiliar with pruning work. As a consequence, output data are probably not indicative of what would be accomplished by experienced men working steadily all day. Comparisons between different tools and methods, the primary purpose of these tests, are significant, however, as in all instances each man used each tool or method the same number of times.

Twenty-Five-Year Old Reproduction, Sands Creek

This vigorous, semiopen-grown stand of almost pure pine represents approximately the best size at which pruning should be begun. All pruning was done from the ground and extended up the bole only as far as a man could reach, or about 7½ feet. Pruning to this height removed about 30 percent of the live crown, which is enough to remove at one time. The average diameter breast-high was 5.1 inches and the total height 30 feet. An average of 24 limbs 0.65 inches in diameter were removed per tree.

Four types of hand tools were used and time studies made on a number of trees pruned. Results were as follows:

Tool Number	Number of Trees Pruned	Number of Limbs Cut per Tree	Time per Tree (Seconds)	Time per Limb Cut (Seconds)
4	10	21.2	184	8.7
5	10	28.1	239	8.5
7	11	19.3	196	10.1
9	10	27.5	140	5.1

On the basis of time per cut which is the most accurate comparison in this instance, tool 9, the small pruner, was distinctly the fastest tool. The quality of the work was excellent, and the tool is easy to operate. There was sufficient shoulder on the tree bole at the point of limb attachment so that no difficulty was experienced in making the cut sufficiently close to the bole. There was a slight tendency, however, to make cuts too far from the bole through trying to reach around the tree or not placing the tool properly. The tool can cut limbs up to 1¼ inches in diameter. Tools 4 and 5 were very effective, and both are thoroughly satisfactory for this work. An important advantage of the saw over the pruner is that any size of limb can be cut. Tool 7 was slower than the other two saws for the reason that the wide blade is not so easy to manipulate among branches close together, and, as it cuts on the thrust stroke, it is more fatiguing to operate on limbs higher than the shoulder. All in all, any of tools 4, 5, and 9 are fully satisfactory for this type of stand. The saws, however, are more versatile and considerably less expensive, even though not quite so fast as tool 9 in this particular stand. Tool 8, the large hand pruner, was not satisfactory for this work. The tool is large and awkward to operate and will not cut close enough to the bole. It does not make so clean a cut as tool 9.

Forty-Five-Year Stand, Deception Creek

This rather dense stand has just reached the size where a full 16-foot log length can be pruned without injury to the tree. The limbs are small, averaging about a half-inch in diameter and are practically all dead within 10 feet above the ground. Average diameter of trees suitable for pruning was about 5.5 inches, total height 35 to 45 feet. Plate 2 shows a typical tree before and after pruning.

Both the ladder and the pole saw method of pruning were tested. Pruning in each case was done to a height of 17 feet. By the ladder method, limbs higher than could be reached from the ground (about 7.5 feet) were cut from a ladder. After a little experimentation, it was found that 11 feet was the best ladder length for the average man. By this method only a ladder and one tool, a hand saw, are required and one man can prune the entire tree.

By the pole saw method, limbs were cut in three stages: up to 7.5 feet by a hand saw, 7.5 feet to 13 feet by an 8-foot pole saw, and 13 to 17 feet by a 13-foot pole saw, thus necessitating three separate tools. In the conduct of the work it was found best to use only one tool per man.

The pole saw method was distinctly faster than the ladder method in this kind of stand. The limbs being small could be cut by means of a pole saw nearly as readily as by a hand saw operated from a ladder. The stand being dense, as are most such stands, a ladder was difficult to carry through the woods.

Tool 5 was preferred as a hand saw. It cuts fast, particularly dry limbs, is easy to operate, serviceable, and inexpensive. Tool 9, the pruner, was not satisfactory. It was difficult to make the cut sufficiently close to the bole as there was no swelling of the bole at the point of limb attachment, and the tool was not so fast as a hand saw on the numerous small dead limbs. Tools 4 and 7 did satisfactory work, but were not judged to be quite so good for the work as No. 5. The shorter teeth of these saws gum up with pitch more readily than No. 5.

Of the pole saws, No. 2 was judged superior to No. 3. The former is extremely well mounted, easy to operate, and does excellent work. No. 3, while a satisfactory tool, is not so well mounted - the socket and adjustable angle of the blade are of no advantage for this work and tend to work loose - and the blade has a little too much sweep to get a full stroke and has a tendency to catch in the cut and tear off the limb when nearly sawed through. Tool 1 was tested but not found satisfactory. It is fatiguing to operate and does not do good work.

Fifty-Year Stand, Searchlight Creek

This is an exceptionally thrifty stand of western white pine and ponderosa pine growing on an excellent site. Diameters of dominant trees range from 10 to 17 inches and heights from 60 to 75 feet. Trees are well spaced and about as limby as can be found in good quality western white pine stands. Live limbs begin at from 10 to 25 feet above the ground. Below these, dead limbs remain solidly attached to the bole practically to the ground. See Plate 3. While this stand has obviously long passed the best pruning size, pruning is still probably worth while, as it is very likely that such a fast-growing stand will be left uncut until the better trees are around 30 inches in diameter.

Both the ladder and pole saw methods were employed. The results of a number of time tests on white pine trees indicated that there was little, if any, difference in speed. By each method it took a trifle over 7 minutes to prune a tree, counting working time only. An average of 50 limbs 0.76 inches in diameter was cut per tree. It was unanimously agreed, however, that the ladder method was distinctly less tiring and would be the preferable method day in and day out in such timber. The principal reason is that the largest limbs are the highest from the ground, and these larger limbs can be cut much more easily with a hand saw from a ladder than with a pole saw operated from the ground. Also, the stand being fairly open, a ladder could be readily moved from tree to tree. Tools 2 and 5 were again found to be the most satisfactory.

A few ponderosa pine trees were also pruned. These trees had considerably larger limbs than the white pine, many of them, especially the higher ones, being 1½ to 2 inches in diameter. On these trees the ladder method was found to be decidedly faster and easier than the pole saw method. Cutting these larger limbs with a pole saw was found to be slow and tiring work. Tool 6, the "Champion-tooth" hand saw, was found to be the best tool for this work.

Recommendations

The best all-around tool of the group tested was tool 5, the 12-inch hand saw. This saw is inexpensive, serviceable, and thoroughly satisfactory. The use of the hand pruner, tool 9, is limited and the tool much more expensive. Tool 4 is nearly as good as No. 5 - to some there is little difference. Tool 7 is a little more expensive and is not so satisfactory as either 4 or 5. Tool 6 is recommended where the majority of the limbs are more than 1½ inches in diameter. Tools 1 and 8 are not recommended.

The pole saw recommended is tool 2.

For most high pruning work in western white pine, the pole saw seems preferable to the ladder method. The latter method is advisable only where limbs to be cut, particularly the higher ones, are large - many of them over an inch in diameter - and where the density of the stand is such that a ladder can be transported with reasonable ease through the woods.

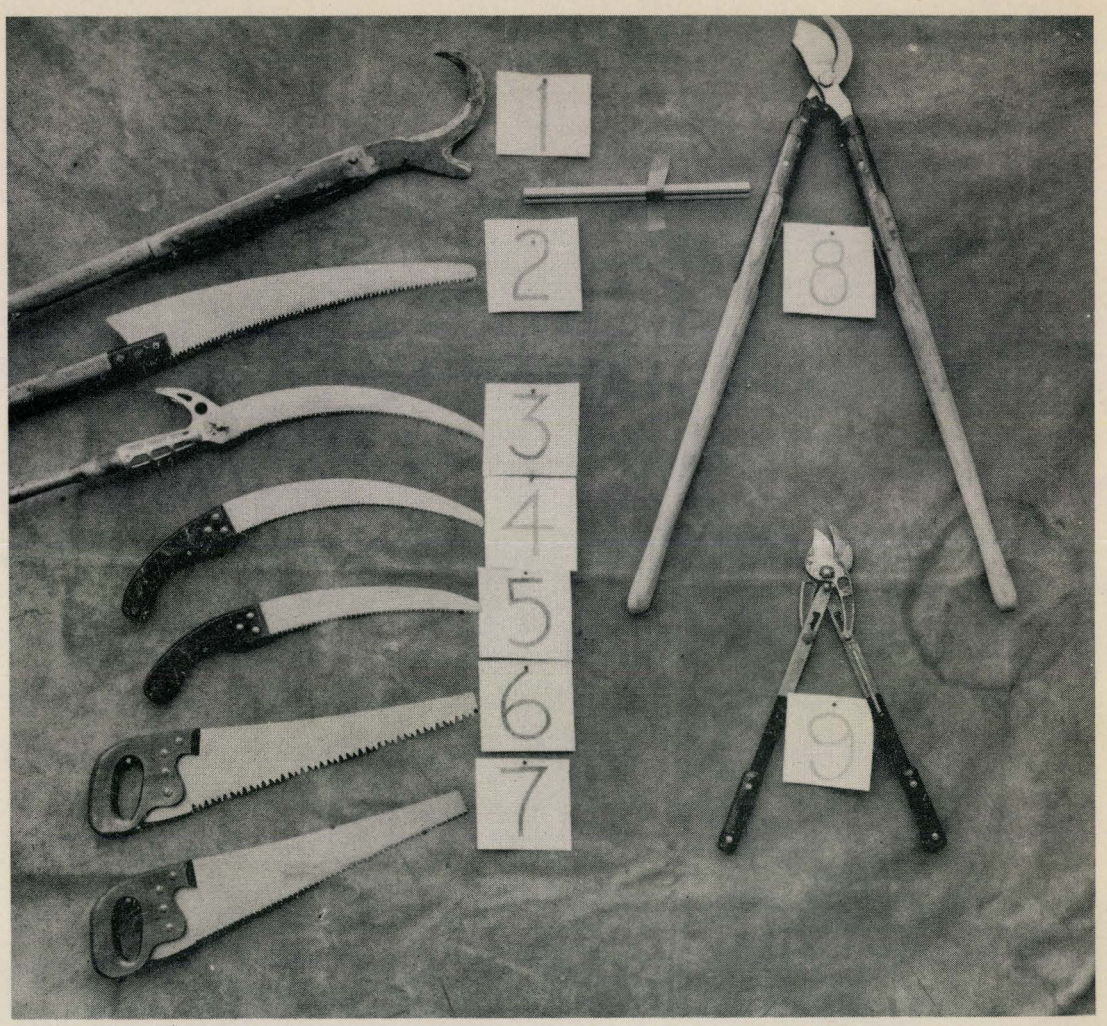

Plate 1.--Pruning tools used.

Before pruning

After pruning

Plate 2. Pruning in 40-year-old western white pine. Deception Creek Experimental Forest, Idaho.

Before pruning

After pruning

Plate 3.--Pruning in 50-year-old western white pine. Searchlight Creek, Coeur d'Alene National Forest, Idaho.